

REMARKS

Original claims 1-47 have been examined and rejected as detailed in the Office Communicated dated May 21, 2007 variously under 35 U.S.C. § 102(b) U.S. Patent No. 6,213,949 to Ganguly et al. (hereinafter Ganguly) and under 35 U.S.C. § 103(a) by the combination of Ganguly and U.S. Patent No. 7,041,059 to Chalana et al. (hereinafter Chalana).

Applicants have amended the original independent and dependent claims, and cancelled claim 47. Thus, claims 1-46 of the claim listing are pending in the instant application.

CLAIM REJECTIONS UNDER 35 U.S.C. § 102(b)

Claims 1-7 have been rejected by citation to Ganguly. Examiner asserts that Ganguly (Col 8, lines 15-30) employs “transducers...using multiple harmonics or frequency measurements” Applicants dispute the Examiner’s assertion that Ganguly teaches the use of “multiple harmonics” or “multiple...frequency measurements”.

Applicants conducted a word search within Ganguly for the terms “harmonics”, “harmonic”, “multiple”, or “multiples” that pertains to obtaining ultrasound images and did not find these terms. The term “frequency” is found in Ganguly, the most relevant being related to the “resonant frequency” of transducers (col 3, lines 16-17) or piezoelectric elements of transducers (col 7, lines 66-67).

Applicants McMorrow et al., as detailed in the instant application as described in U.S. Patent Application Publication No. 2006/0111633, teaches the development and use of ultrasound harmonics. In contrast, Ganguly does not teach or otherwise employ the harmonic teaching of McMorrow. In paragraph 0009 of McMorrow, the advantageous use of ultrasound harmonics is described that develops within ultrasound echoes while transiting through fluid encasing or otherwise fluid associated tissues. That is, nothing in Ganguly teaches the development or utilizing of returning ultrasound echoes having “...higher harmonic components...” that “...build up during propagation and thus be reflected in the returning echo.”



(McMorrow, paragraph 0009, sentence 5). Despite this lack of teaching of ultrasound harmonics in Ganguly, independent claim 1 has been currently amended to claim the particular embodiments of the instant application.

As regards currently amended claim 1 presented in clean form below with the amended portion italicized, Ganguly does not teach of an apparatus for *detecting a body cavity of a subject, measuring the volume of the body cavity and a fluid volume contained in the body cavity comprising at least one transducer assembly positioned in view of the body cavity and configured to transmit ultrasound of at least one acoustic power having a fundamental frequency to the body cavity, receive echoes having a harmonic frequency and the fundamental frequency reflected from surfaces associated with the body cavity, and convert the fundamental and harmonic frequency echoes into fundamental and harmonic signals, and a computer in signal communication with the at least one transducer assembly, the computer having executable signal processing software with programmed instructions to differentiate information from the fundamental and harmonic signals and to calculate the volume of the body cavity and the fluid volume contained in the cavity based upon image information derived from the harmonic signals.*

Dependent claims 2-7 have been currently amended to be consistent with currently amended claim 1.

By these amendments, Applicants assert that currently claims 1-7 are novel over Ganguly and accordingly, in condition for allowance.

CLAIM REJECTIONS UNDER 35 U.S.C. § 103(a)

Original claims 1-47 were rejected by the combination of Ganguly and Chalana. The Examiner asserts that Ganguly (col 8, lines 15-30) employs “transducers...using multiple harmonics or frequency measurements...”. Applicants dispute the Examiner’s assertion that Ganguly or Chalana teach or suggest the use of “multiple harmonics”.

Concerning ultrasound or ultrasound transducers, Ganguly, for lack of search terms “harmonics”, “harmonic”, “multiple”, or “multiples” discussed above nor is “harmonic” or “harmonics” mentioned in Chalana. Thus, there is a lack of teaching or suggestion for the use of harmonic ultrasound in obtaining ultrasound based images in these references. Accordingly, this lack of harmonic teaching in Ganguly and Chalana means that the rejection under 35 U.S.C. § 103(a) cannot be maintained for the independent claims 1, 20, 44, and 45, and by virtue of claim dependency, the related dependent claims.

Chalana uses “frequency” in the sense of “radio frequency ultrasound” (col 4, line 53), or refers to a transceiver 10 that “...can be adjusted to *transmit* a range of probing ultrasound energy from approximately 2 Mhz to approximately 10 Mhz radio frequencies” (col 4, lines 57-59), which would mean a range of transmitted ultrasonic fundamental frequencies, not harmonic frequency multiples contained within reflected echoes that have undergone constructive interference returning from probed surfaces. Other uses of frequency would be “radio frequency signals” (col 5, line 59), or of an ultrasound transceiver “operating at 3.7 MHz frequency” (col 6, line 60). At best, it might be construed that Chalana teaches the use of “ multiple...frequency measurements” available in the 2-10 MHz range (col 4, lines 57-59), but again that would be for measurements arising from transmitted, fundamental frequencies selected from a range of transceiver transmitted frequencies, not reflected echoes experiencing constructive interference from probed surfaces.

Chalana uses “multiple” (Col 8, lines 48-56 in sense of multiple scan cones, multiple 3D arrays, multiple 3D images, and multiple conic arrays, and similar, but **not** in the sense of “multiple harmonics”.

Despite the lack of teaching or suggestion for harmonics by Ganguly or Chalana, or by the combination of Ganguly and Chalana, independent claims 1, 20, 44, and 45 have been currently amended to claim the particular embodiments of the instant application, along with the dependent claims to maintain consistency with the amended independent claims.

As regards currently amended claim 1 presented in clean form below with the amended portion italicized, Ganguly does not teach nor suggest of an apparatus for *detecting a body cavity of a subject, measuring the volume of the body cavity and a fluid volume contained in the body cavity comprising at least one transducer assembly positioned in view of the body cavity and configured to transmit ultrasound of at least one acoustic power having a fundamental frequency to the body cavity, receive echoes having a harmonic frequency and the fundamental frequency reflected from surfaces associated with the body cavity, and convert the fundamental and harmonic frequency echoes into fundamental and harmonic signals, and a computer in signal communication with the at least one transducer assembly, the computer having executable signal processing software with programmed instructions to differentiate information from the fundamental and harmonic signals and to calculate the volume of the body cavity and the fluid volume contained in the cavity based upon image information derived from the harmonic signals.*

As regards currently amended claim 20 presented in clean form below with the amended portion italicized, neither the combination of Ganguly and Chalana teach or suggest a method for detecting a body cavity of a subject, *measuring the volume of the body cavity and a fluid volume contained in the body cavity comprising positioning at least one transducer assembly in view of the body cavity, transmitting a fundamental ultrasound frequency of at least one acoustic power to the body cavity; receiving echoes having the fundamental ultrasound frequency and at least one harmonic frequency thereof associated with the body cavity, converting the received ultrasound echoes into fundamental signals and harmonic signals, determining boundary information of the cavity from the harmonic signals, and calculating at least one of the volume of the cavity from the boundary information and the fluid volume in the body cavity.*

As regards currently amended claim 44 presented in clean form below with the amended portion italicized, neither the combination of Ganguly and Chalana teach or suggest a method for *detecting a body cavity of a subject, measuring the volume of the body cavity and a fluid volume contained in the body cavity comprising positioning at least one transducer assembly in view of*



the body cavity, transmitting a fundamental ultrasound frequency of at least one acoustic power to the body cavity, receiving echoes having the fundamental ultrasound frequency and at least one harmonic frequency thereof associated with the body cavity, converting the received ultrasound echoes into fundamental signals and harmonic signals, determining boundary information of the cavity from the harmonic signals, calculating at least one of the volume of the cavity from the boundary information and the fluid volume in the body cavity, and adjusting the calculation by comparison with at least one of a look up table and a calibration curve.

As regards currently amended claim 45 presented in clean form below with the amended portion italicized, neither the combination of Ganguly and Chalana teach or suggest a method for *detecting a body cavity of a subject, measuring the volume of the body cavity and a fluid volume contained in the body cavity comprising positioning at least one transducer assembly in view of the body cavity, transmitting a fundamental ultrasound frequency of at least one acoustic power to the body cavity, receiving echoes having the fundamental ultrasound frequency and at least one harmonic frequency thereof associated with the body cavity, converting the received ultrasound echoes into fundamental signals and harmonic signals, determining boundary information of the cavity from the harmonic signals in terms of depth, height, and correction factor, K, calculating at least one of the volume of the cavity from the boundary information and the fluid volume in the body cavity as a product of depth, height, and correction factor K, and adjusting the calculation by comparison with at least one of a look up table and a calibration curve.*

By these amendments, Applicants assert that claims 1-46 are non-obvious over Ganguly and accordingly, in condition for allowance.



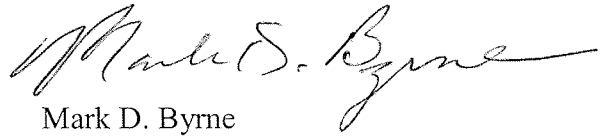
CONCLUSIONS

Applicants assert that pending claims 1-46 are novel, non-obvious, fully enabled and accordingly in condition for allowance. A Notice of Allowance is therefore earnestly solicited.

If the Examiner has any questions, the Examiner is invited to contact the Applicant's agent listed below.

Respectfully submitted,

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